The American Midland Naturalist

PUBLISHED BI-MONTHLY BY THE UNIVERSITY
OF NOTRE DAME, NOTRE DAME, INDIANA

VOL. VIII. MARCH AND MAY, 1923. NOS. 8-9

Notes Relative to the Species of Gambusia in the United States.

S. W. GEISER,

WASHINGTON UNIVERSITY, SAINT LOUIS.

*(From the Zoölogical Laboratory of the Johns Hopkins University.)**

REGAN ('13) in his revisional paper on the viviparous *Poeciliidae* or top-minnows of the world has ascribed to the territorial limits of the United States three species of the genus *Gambusia*; *holbrooki, patruelis,* and *affinis.* He maintains that *Gambusia holbrooki* (Grd.) Guenth. is distributed from "Virginia to Alabama;" *G. patruelis* (B. & G.) Grd. from 'Florida to Texas;" and *G. affinis* (B. & G.) Grd. from "Florida to Tampico; Mississippi." Owing to the rarity of males in field-collections of Poeciliidæ, he had no males of some of the different "species" for comparison; and hence the descriptions which he gives of the different "species" do not appear to really satisfactorily differentiate them from other "species." Color-markings, for example, may vary widely; the ground-color, also may differ markedly in the different habitats. The characters which he used in differentiating species, in fine, vary so greatly that it is impossible to clearly discriminate between his species.

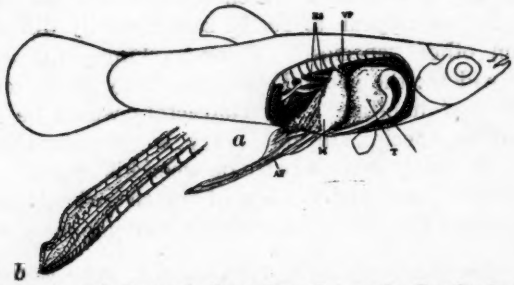
As a result of this, and in view of the remarkable diversity in the form and the color of *Gambusia* contemporary workers

* My heartiest thanks are due to Professor S. O. MAST and Mr. S. F. HILDEBRAND. The work was done under the direction of Professor MAST, and to him the writer is indebted for valuable suggestions and help. Mr. HILDEBRAND supplied much valuable material which otherwise was inaccessible, gave notes on distribution, and contributed otherwise. I am indebted to both Professor MAST and Mr. HILDEBRAND for criticising the manuscript.

regard those of the United States as comprising a single species, *Gambusia affinis* and they look upon *G. holbrooki* and *G. patruelis* (along with other names long since gone into the synonymy) merely as varieties, or as entirely synonymous and without taxonomic standing.

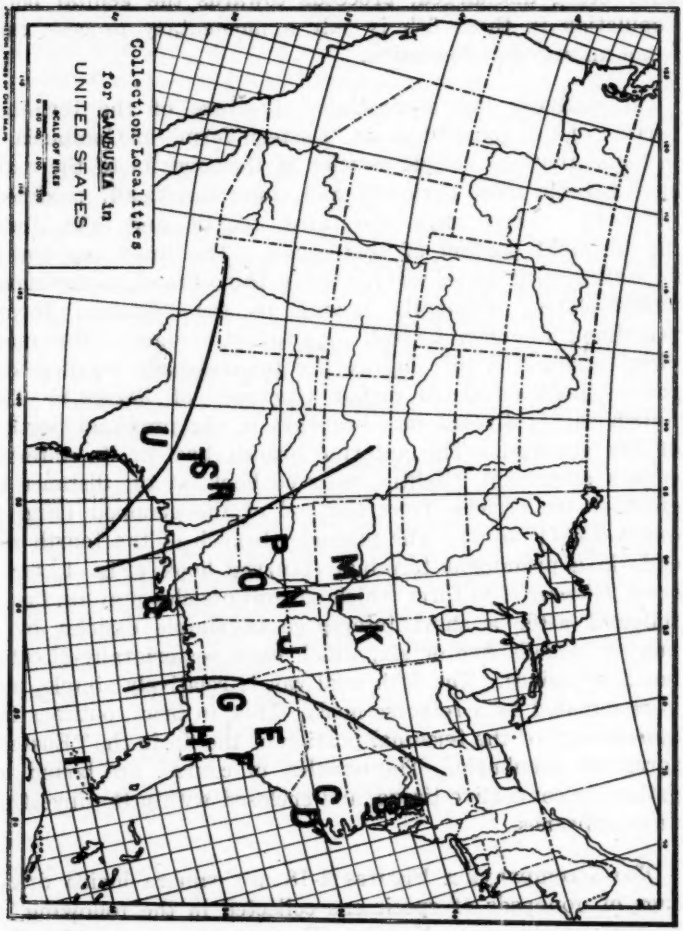
In the course of studies on top-minnows the writer has found evidence that we have in these forms certain well-defined types. This evidence is here presented. It is drawn from the microscopic structure of the terminal portion of the copulatory organ, or *gonopod*, of the fish.

It will not be necessary to speak here of the general form and structure of the gonopod, and its origin, development, and microscopic structure in the different genera of Poeciliid fishes, for this has already been done in the admirable papers by LANGER ('13), REGAN ('13), MEEK & HILDEBRAND ('16), and HENN ('16), and by EIGENMANN ('07, '12). Suffice it to say that in the viviparous Poeciliids the anal fin is metamorphosed in the male into a complex, usually imperforate copulatory organ or gonopod, by means of which the male is able to transfer balls of sperm, the specialized *spermatozeugmata* (sing., spermatozeugma) from his own genital aperture to that of the female. The third, fourth and fifth anal-fin rays are modified in male Gambusia to form the distal portion



Text-figure A. (a) Lateral dissection of a male *Gambusia holbrooki*, showing the general relations of gonopod to other organs, especially the internal organs of the body. (*I*, intestine; *T*, testis, *AF*, gonopod; *HS*, modified haemal spines; *M*, muscle controlling gonopod; *VP*, ventral process of abdominal vertebrae.) (*b*) Detail drawing of end of the gonopod. (After KUNTZ, '14.)

of the copulatory organ (Fig A, *a*.) The anal fin, of course, is a fused, single, unpaired median organ. While the gonopod in Gambusia, and in most other Poeciliids, is



Text-figure B. Collection-localities for *Gambusia* used in this study. A number of other localities, very near other stations indicated, are not marked on the map. (*E. g.*, Key West, near Big Pine Key, Fla.)

imperforate, it should be noted that the two sets of fin-rays in the fused median organ form on the anterior border of the gonopod a trough or furrow down which the sperm-ball, after being discharged, proceeds towards the genital pore. Copulation in these fish is only a momentary process, and is not an act of intromission.

On studying the microscopic structure of the terminal portion of the gonopod of an "Eastern form" of Gambusia it is found that the simple ossicles of the anal fin of the male have become most curiously and characteristically modified. (Fig. 1). Three rays, the third, fourth, and fifth, form the terminal portion of this organ. The third ray forms an unbranched series of relatively thin, broad, conspicuous trough-plates, frequently having in the "Eastern form" prominent angular, lateral, longitudinal ridges. The most distal ossicles of this fin-ray are progressively smaller and possess hooks directed distad (*"serrae"* of REGAN.) The fourth ray is divided into branches in the proximal portion of the gonopod. The anterior branch has on its anterior edge a prominent, slightly recurved hook, at the distance of eight or ten ossicles from the end of the gonopod (Fig. 1, *ant. hook, IV. ant.*) The posterior branch of the fourth ray ends in a prominent terminal recurved hook (Fig. 1, *term. hook, IV post.)*, to form which several ossicles may be fused, followed after a short interspace of simple ossicles by a number usually five or six, which have posteriorally-directed hooks or spines. The fifth anal ray is relatively simple, and is terminated by a retrorse hook. This, in brief, outlines the morphology of the terminal portion of the fin in the "Eastern form" of Gambusia. The ossicles, of course, are bound together by connective tissue, and enclosed within the investing fin-membranes.

The accompanying Figures 1-18 are camera lucida drawings of gonopods of specimens collected in the following localities: Goldsboro, N. C., (Figs. 1-2); Savannah, Ga., (Fig. 3); Augusta, Ga. (Fig. 4); Big Pine Key, Fla., (Fig. 5); Little Rock, Ark., (Figs. 6-7); Austin, Tex., (Figs 8-9);

Camilla, Ga., *in the Gulf Drainage*, (Fig. 10); Huntsville, Ala., (Fig. 11); Memphis, Tenn. (Fig.12); Greenwood, Miss., (Fig. 13); Jacksonville, Tex., (Fig. 14); San Marcos, Tex., (Figs. 15-18.) Material was obtained from various other localities in Maryland, Virginia, North Carolina, Illinois, Indiana, Missouri, Georgia, and Florida. The drawings are reproduced at the magnifications indicated in the legend.

It will thus be seen that the localities from which material was studied lie in three general sections of the United States: The Atlantic Coastal Plain, the Central Mississippi Valley region, and the Southwest.

Material collected at the Mexican Border shows itself on examination to be typical *Gambusia senilis*, a Mexican form which shows in the type of its gonopod-structure very striking and extensive dissimilarity to the material from the rest of the United States. (Figs. 15-18.) On comparison of the figures mentioned with those of gonopods of fish from other localities, it will be seen that the Mexican Border form is completely different.

The material from the three general localities (with the exception just noted) also show differences, but not so striking, in the finer structure of the gonopod; differences that appear to be relatively constant. A comparison of Figures 1-5, 10 (*Eastern form,*) with Figures 6-7, 11-13 (*Central form,*) and Figures 8-9, 14 (*Western form,*) illustrates the differences. These differences are presented in tabular form in Table I:

This table shows that the structure of the third ray in the Eastern material is sharply different from that of both the Central and Southwest material, for in the former there is a prominent series of posterior teeth on the proximal ossicles —a characteristic that is lacking in both the Central and the Southwest forms. The prominent longitudinal lateral ridges present on the third rays of the Eastern form appear also to be entirely lacking in the Central and Southwestern forms.*

* Since the above was written, material has been obtained from the "Central" region which shows lateral ridges; but these ridges do not appear to be nearly so prominent as in the "Eastern form."

TABLE I.—Showing the differences in microscopic structure of the gonopods of *Gambusia* found in different parts of the United States.

EASTERN FORM	CENTRAL FORM	WESTERN FORM.
III. Ray:	**III. Ray:**	III. Ray:
11-14 end ossicles with antero-distally directed teeth.	8-10 end ossicles with antero-distally directed teeth.	12-14 end ossicles with antero-distally directed teeth.
Posterior teeth on the larger ossicles near the distal end.	No posterior teeth present on the larger ossicles near the distal end.	No posterior teeth present.
Ossicles in many of the rays with sharp lateral ridges.	No such ridges.	No such ridges.
IV. Post. Ray:	IV. Post. Ray:	IV. Post. Ray:
Usually 2 ossicles united to form terminal hook.	Usually 3 ossicles in terminal hook.	Usually 6 ossicles bearing posteriorally directed teeth.
Usually 7 ossicles bearing each posteriorally-directed tooth, usually curved in outline, and the apiices directed either proximad or distad. The angle slightly less than a right angle.	Usually 5 ossicles bearing posteriorally-directed teeth; their apices being directed proximad and at a sharp angle.	
Ossicles with 2 teeth present.	None.	

Thus, the Central and Southwestern material appears to be much more nearly related to each other than they are to the Eastern material. However, the Central material is sharply different from the Southwestern in the number of ossicles forming the terminal hook of the fourth posterior ray, since the Central material has usually 3 ossicles, while the Southwestern has usually six. The Central material in this respect resembles the Eastern material which has usually 2 ossicles in the terminal hook of the fourth posterior ray.

In the number of ossicles of the fourth posterior ray which bear teeth on their posterior edge, the three forms show marked and distinguishing differences. In the Eastern form, there are 7 ossicles (*mean number,*) which bear a single tooth. Both the Central and Southwestern forms lack these ossicles bearing two teeth. The Central material also differs sharply from the Eastern form in the fact that the teeth in the former are often straight and are set at a very sharp angle to the longitudinal axis of the ray (Figs. 11-13) while in the Eastern material the teeth of the fourth posterior ray have usually a curved outline, and their apices are directed either proximad or distad, (the apices of the proximal teeth being usually directed distad.) The angle which these teeth make with the longitudinal axis of the ray is very much more nearly a right angle. The Southwestern form differs from the Central form in making a less acute angle with the ray-axis, as well as in possessing usually more posteriorally-directed teeth on the fourth posterior ray. These are the main similarities and differences of structure of the gonopod in individuals of Gambusia from the three regions.

It might be thought that the enumerated differences occurring between Central and Southwestern forms were due to differences in habitat. Difference in habitat will, however, account for very little of the variation found in the gonopods, for specimens from Maryland to Key West and from Illinois to Louisiana have a close adherence in all cases to the type characteristic of the Eastern and the Central form, respectively, and the habitat of different regions in each of these two districts differs fully as much as does that of the

None.
Ossicles with 2 teeth present.

other two districts. No cases of overlapping were found between Central and Southwestern forms, or between Eastern and Central forms.

All of the individuals studied were Gambusia. (REGAN, '13, Figs. 168-169.) There is no possibility of males of other genera having without our knowledge gotten into our collections, for the microscopic structure of the gonopod in the other viviparous Poeciliids living in the United States are sharply dissimilar from it in form. The merest tyro could instantly distinguish them.

The Gambusia type which I have here called the "Eastern form" corresponds in its structure with the species figured by REGAN (Fig. 169, A) as *Gambusia holbrooki*. None of his figured gonopods of other species of *Gambusia* resemble in a close way the structure of what I have called the "Central" and "Southwestern" forms of Gambusia. In *Gambusia nicaraguensis* (Fig. 168, A), *G. wrayi* (Fig. 168, B), and *G. oligosticta* (Fig 169, B), there are small points of resemblance to our material, but with these points of resemblance there exist fundamental and glaring differences.

The Eastern form of Gambusia is the only one of the group in the United States which possesses denticulations on the posterior border of the ossicles of the third ray. In all other species, so far as I am aware, these borders are entire in outline.

The distribution of the Eastern form is from New Jersey to Key West, and it has invaded to a slight extent the Gulf drainage of western Georgia, being found in the Flint R. at Cammilla, Ga. The exact limits of its East-West range are, in the lack of material, not yet ascertained.

Practically all students of the *Poeciliidae* agree with REGAN ('13) in the conclusion that the "differences in structure of the intromittent organ are of great systematic importance." EIGENMANN ('07, '12), LANGER ('13), and HENN ('16) have used them as a basis for ascertaining generic relationships and affiliations. These differences of structure have proved to be remarkably constant to a type. Species within the same genus (as, *e. g.*, the various species of *Gambusia* whose gonopods

are figured by REGAN, or of *Mollienisia* and *Neoheterandria* figured by HENN) also show a close adherence to a specific type of structure at the same time that they conform to a generic type. Just as it has been possible for REGAN in his synoptic paper to diagnose for each genus the microscopic structure of the gonopod, so also does it appear possible to give diagnoses of the gonopod of each species. It appears conclusively to the writer as the result of an extensive examination of gonopods that by means of the structure of the gonopod alone it is possible to determine correctly the species to which a given top-minnow belongs.

It is easily seen from these studies that the so-called "species" *Gambusia affinis*, as at present understood, is not a single, unified species. The Atlantic Coastal Plain form would appear to be sharply distinct from the other two forms, and hence merits the status of a distinct species. It appears that it should be known as *Gambusia holbrooki* Grd. In the case of the two other forms the case is not so clear. The Central material obtained from Illinois, Arkansas, and Louisiana (as well as other states) shows certain fairly constant differences from the Southwest material, as has already been noted. Since the differences found in the gonopod-structure of fish from the two sections are not of so fundamental a sort as those noted as existing between the Central and Eastern material, I should merely class the two as varieties and not call them distinct species. And as *Gambusia affinis, is* described earlier than *G. patruelis* in Baird & Girard's 1854 paper, it appears that the former name has the priority.

SUMMARY.

(1.) The *Gambusia* of the United States are usually included in one species, *Gambusia affinis*.

(2.) REGAN has held on general anatomical grounds that there are three species, *G. affinis*, *G. patruelis*, and *G. holbrooki*, within the territorial limits of the United States.

(3.) The microscopic structure of the gonopod in Poeciliid fishes has been proved by the work of a number of investigators to be a completely satisfactory criterion of generic and specific relationships.

(4.) Study of the finer structure of the gonopods of material

gathered from the Eastern, Central, and Southwestern sections of the United States shows constant differences between these forms.

(5.) The structure of the gonopod of the Eastern form is strikingly different in certain respects from that of the two other forms. This form deserves specific rank as *Gambusia holbrooki* Grd.

(6.) The evidence is, however, not clear for the Central and Southwestern forms that the differences indicate more than varietal relationships of these forms. The material may be tentatively grouped together as *Gambusia affinis* B. & G.

(7.) The Mexican species *Gambusia senilis* has invaded Southern Texas, and is now found at San Marcos and other localities.

LITERATURE CITED.

EIGENMANN, C. H. (1907.) The Poeciliid fishes of Rio Grande do Sul and La Plata basin. Proc. U. S. Nat. Mus. *32*: 425-433.

(1912.) The freshwater fishes of British Guiana, including a study of the ecological grouping of species and the relation of the fauna of the plateau to that of the lowlands. Mem. Carneg, Mus. *5:* 1-578, 103 plates.

HENN, A. W. (1916.) On various South American poeciliid fishes. Ann. Carneg. Mus. *10*: 93-142.

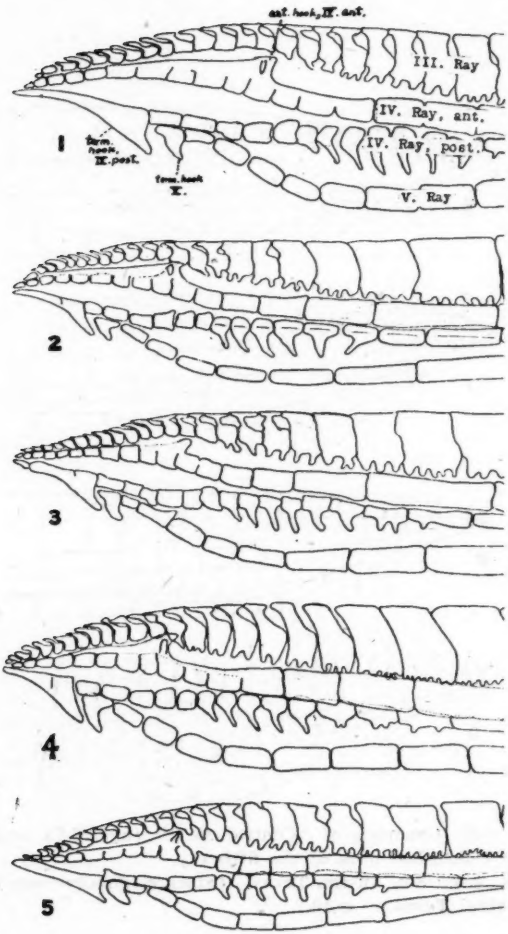
HILDEBRAND, S. F. (1917.) Notes on the life-history of the minnows Gambusia affinis and Cyprinodon variegatus. Rept. U. S. Commr. Fisheries for 1917. Appendix VI. (15 pp.)

KUNTZ, A. (1914.) Notes on the habits, morphology of the reproductive organs, and embryology of the viviparous fish Gambusia affinis. Bull. U. S. Bur. Fisheries *33*: 177-190.

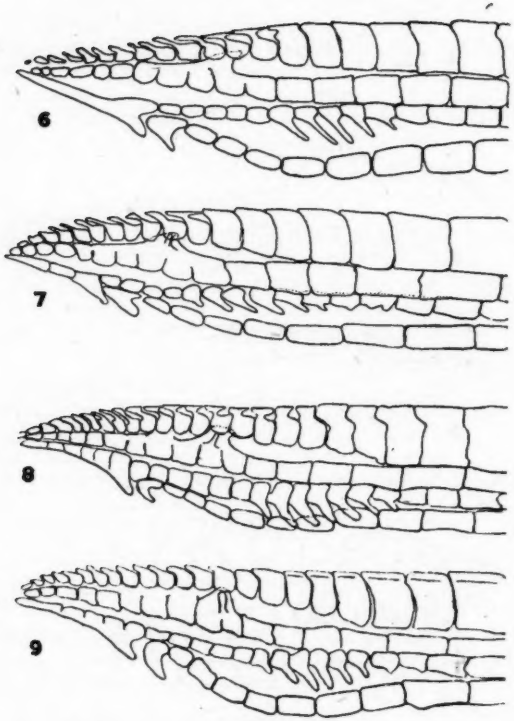
LANGER, W. FR. (1913.) Beiträge zur Morphologie der viviparen Cyprinodontiden. Morph. Jahrb. *47*: 193-307.

MEEK, S. E. & S. F. HILDEBRAND (1916.) The fishes of the Canal Zone of Panama. Publ. Field Columb. Mus. (Zool. Ser.) *10*: 217-374.

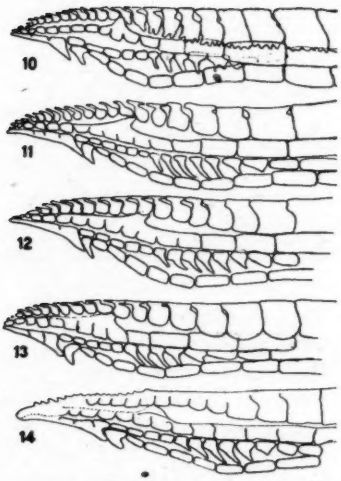
REGAN, C. T. (1913.) A revision of the cyprinodont fishes of the subfamily Poeciliinæ. Proc. Zool Soc. London *1913:* 977-1018.



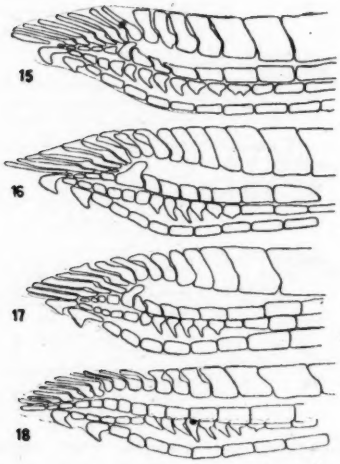
Figures 1-5. Gonopods of "Eastern form" of Gambusia (*G. holbrooki*) from various localities. *1-2* Goldsboro, N. C.; *3*, Black race of males from Savannah, Ga.; *4*; Augusta, Ga.; *5*, Big Pine Key, Fla. *(Ant. hook, IV. ant.*-anterior hook of the anterior branch of the fourth ray; *term. hook, IV Post.*-terminal hook of the postrior branch of the fourth ray;



Figures 6-9. Gonopods of "Central form" (figs. 6-7) and "South-*term, hook V*-terminal hook of the fifth ray.
Little Rock, Ark.; 8-9, Austin, Texas. (Stock originally from Brazos R. in southcentral Texas.) x 40.)



Figures 10-14. Gonopods of *Gambusia* from various localities. 10, Camilla, Ga. ("Eastern form," in the Flint R. drainage); 11, Huntsville, Ala. ("Central form"); 12, Memphis, Tenn. ("Central form"); 13, Greenwood, Miss., ('Central form"); 14, Jacksonville, Texas ("Western form.") *In Fig. 14 an immature, incompletely differentiated gonopod is shown.* x 27.



Figures 15-18. Gonopods of *Gambusia senilis (nobilis)* from south central Texas, on the San Marcos R. at San Marcos. Note the radically different type of gonopod structure. x 27.

The Birds of Floyd County, Iowa.

BY CARROLL LANE FENTON.

I.—INTRODUCTION.

In 1916 I published, in the Wilson Bulletin (No. 96, pp. 130-138), a paper entitled "Preliminary List of the Birds of Floyd County, Iowa." This list extended through the Raptores, and included ninety species and subspecies. Several of the references, however, were either questionable or erroneous. A combination of circumstances made it impossible to complete the list in the Wilson Bulletin. Instead, the entire paper has been re-written, much material has been added, and all data carefully checked. The resulting paper is considerably larger, more detailed, and it is hoped, more reliable, than that originally published in the Wilson Bulletin.

The sources of material and notes are varied. The principal one, of course, is my own field notebooks, made from 1914 to 1922. These have been supplemented by the field notes of Mr. H. Clarke Brown, now of Geneva, Ill., but formerly of Charles City, Ia. For several years Mr. Brown and I worked together, and his share in the list is larger than the acknowledgments indicate. Clement L. Webster, John R. Waller, and the late Mrs. Mary A. Dutton, all of Charles City, have furnished numerous notes, and have assisted in securing and verifying "early days" records. Through various other observers, brought together through the Bird Bureau of the Califor Naturalist Club, of Charles City, much data have been secured. Published material has been taken from the books and papers mentioned in the bibliography.

A final source of information is the Miles collection of birds, made by a former resident of Charles City, and now in the Charles City High School. The collection is in bad repair, and many of the labels appear to have been lost since Dr. Bailey assisted me in examining it; nevertheless the notes taken at that time, and the remaining specimens, have proved of much value.

For assistance in checking reports and records, and in editing of the manuscript, I am indebted to Mr. Ira N. Gabrielson, Dr. Lynds Jones, and Miss Althea M. Sherman. The late Dr. B. H. Bailey, of Coe College, Cedar Rapids, examined manuscript and specimens, checking virtually all the material in hand in 1916. Finally, the entire manuscript, in virtually its present form, has been read by Dr. T. C. Stephens, of Morningside College, who has made copious notes and valued suggestions.

II. —GEOGRAPHY OF FLOYD COUNTY.

A.—Topography.

Floyd County lies within the area covered by the Iowan drift sheet. In general its surface is gently rolling, with no very deep valleys or bold hills, and few to many undrained depressions, depending upon the exact spot under consideration. On the whole it may be considered as typical of what McGee has styled the "rolling Iowan" prairies.

The largest stream in the country is the Cedar (more properly, Red Cedar) River, which flows southeastward through the county. It is a broad, rather sluggish stream stopped by a large dam at Charles City, and a small, dilapidated one at Floyd. The Charles City dam causes a considerable widening of the stream, and assists somewhat in the formation of marshy "bayous" northwest of the town. North of Floyd the river banks are high, and in some places steep, with prominent limestone faces, but near and south of Charles City the banks are low and gently sloping.

Flood Creek, a small stream, flows roughly parallel with the Cedar River, but several miles west of it. Its banks are low, and very largely of drift.

The Shell Rock River parallels Flood Creek in the western part of the county. It is similar to, but considerably smaller than the Cedar River, and its banks are somewhat steeper. Its tributary, Lime Creek, flows through Cerro Gordo county, entering Floyd northwest of Rockford. For a considerable distance it flows through a broad, flat valley at the base of clay hills sixty to eighty feet in height. The most abrupt

of these is in Cerro Gordo County, and is known generally as the Hackberry Grove Clay Bank. There are no other large streams in the county.

Due to the relative youth of the glacial drift there are still many undrained depressions. Along the line of the Chicago, Milwaukee, and St. Paul railway, between Rudd and Charles City, there are considerable areas of slough land. This was at one time of little agricultural value, but drainage has now made it suitable for farming. East and southeast of Charles City, and northwest of Floyd there are numerous sloughs, not yet thoroughly drained. The balance of the land is high, rolling prairie.

B.—Forests.

The natural forests of the region are largely oak, with some lindens and other trees. Poplars, willows, etc., are not abundant among the natural forest trees. Thornapple, wild plum, hazel, and various bushy trees make up the scrub growth.

The principal areas of natural forest are along the streams, as shown in the map. The belt along the Cedar River is the largest of these, and despite continued cutting, covers some thousands of acres. The largest area of woodland away from streams is Wallers' Woods, northeast of Charles City.

The introduced woodlands are largely of fruit trees, evergreens, and elms. Soft and Manitoba maples are common. Along some of the roads there are rows of willow trees, but the custom is less prevalent in Floyd than in more central counties of Iowa. While the total of introduced forest probable about equals the cut-off of natural timber, it is less attractive to birds. This is due partly to the location and distribution of the planted trees, and partly to the fact that they do not offer particularly good nesting sites to the birds which build in low, shrubby trees.

C.—Roads, Transportation.

In the map there is no indication of the roads. They are, for the most part, unpaved, and with the exception of a few "pikes" only moderately traveled. Weeds and bushes are

allowed to grow along their sides, and by offering nesting sites they are probably of more value than harm to birds. The railways are all single track lines, with but few trains daily. So far as noticeable they have neither favorable nor unfavorable effect upon bird life.

D.—Industries, Population.

Floyd County is dominantly a region of grain farms. Corn is the principal grain raised, although there are large fields of oats. Pasture land is not extensive.

Rockford, with a population of about 1,400 and Charles City, with a population of about 7,200 are the largest towns in the county. Charles City is dependent for much of its presperity upon the factory of the Hart-Parr Company, manufacturers of oil tractors. There are other minor factories, and a very large nursery. The city is attractively built, with plenty of trees, large lawns, and a large wooded park, Wildwood Park, to the southwest.

Rockford, Nora Springs, Floyd, and Marble Rock are farming towns. There are several small villages, of no particular consequence to the fauna, in the country.

Floyd County, therefore, is a typical section of the northern part of the Iowa corn belt. Its population is moderate, its industries mainly that of any farming community. Yet the effect of these industries and populations on animal life has been considerable. Generalizations on this subject would have little point; the specific examples are brought out in the various species noticed.

III.—LIST OF SPECIES AND SUBSPECIES.

1. *Colymbus holboelli* (Reinh.) Holboell's Grebe. Webster states that this species nested near Charles City in the 60's, but it is now a very rare migrant. Webster reports a flock of six birds, seen near Hackberry Grove, Cerro Gordo county on March 26, 1916. I have a questionable record for May 26, 1916, at Charles City.

2. *Columbus auritus* (Linn.) Horned Grebe. Common migrant in "early days" (Webster). Now a rare migrant and rarer summer resident. Mr. J. H. Waddell reports a pair as

having nested near Floyd in 1913; I know of no other nesting records in recent years.

3. *Podilymbus podiceps* (Linn.) Pied-billed Grebe. Common migrant, and somewhat less common summer resident. In 1915 a pair nested within the limits of Charles City.

4. *Gavia immer* (Gunn.) Loon. Rare migrant, though formerly common as a migrant, and not rare as summer resident (Webster). Last reported observation near Charles City, March 23, 1916, by W. T. Swartz.

5. *Gavia arctica* (Linn.) Black-throated loon. Webster states that this species had disappeared prior to 1897. John R. Waller tells me that as late as 1870 it was a not uncommon migrant, but decreased in numbers rapidly after that. I have no definite data.

6. *Larus argentatus* (Brünn.) Herring Gull. Fairly common migrant, being seen in middle to late March. The species is common about Clear Lake, in Cerro Gordo county.

7. *Larus franklini* (Sw. & Rich.) Franklin's Gull. Uncommon migrant, probably no longer to be found in the county. A specimen was taken near Floyd, in 1898, by W. C. Miles.

8. *Sterna forsteri* (Nutt.) Forster's Tern.

9. *Sterna hirundo* (Linn.). Common Tern. These two species, which cannot be distinguished with certainty in the field, appear to be rather common in Floyd and Cerro Gordo counties. One or the other—perhaps both—nests at Clear Lake.

10. *Sterna antillarum* (Less.) Least Tern. Formerly an uncommon migrant, occasionally rather common in Cerro Gordo County. (Webster). ". . . very plenty on Clear Lake, Iowa," (Krider, Forty Years' Notes, p. 82.). I have no records for the species.

11. *Hydrochelidon nigra surinamensis* (Gmel.) Black Tern. A common or tolerably common migrant, arriving in late March or early April. Howard Clarke Brown and others, as well as myself, have seen them in the neighborhood of Charles City, and at Willow Pond.

12. *Phalacrocorax auritus auritus* (Swainson.) Double-crested Cormorant. The data on this species are somewhat confusing. Webster states that he has never seen a specimen in Floyd County, but has seen them at various times near Clear Lake, in Cerro Gordo County. I have never observed the species, either in Floyd or adjoining counties, although there is a specimen in the Miles collection labelled "Floyd, 1891." On the other hand Mrs. W. I. Fredrickson and John R. Waller, both reliable observers, saw a flock of 10 of these birds near Charles City on April 14, 1919, and a week later Mr. Waller identified the species. This year (1921) comes an unsubstantiated though probably reliable record of the Cormorant from Mitchell County.

13. *Pelecanus erythrorhynchos* (Gmel.) White Pelican. This species was at one time a tolerably common migrant (Waller, Webster, Swartz). The Miles collection contains one specimen taken near Charles City in 1890. This is the latest record I have been able to find.

14. *Mergus americanus* (Cass.) Merganser. Rare migrant, there being no records of it since 1908 when specimens were shot by Mr. Waller. The Miles collection contains a specimen taken near Charles City in 1904.

15. *Lophodytes cucullatus* (Linn.) Hooded Merganser. Both Webster and Waller state that this species was never common in Floyd and adjoining counties. The Miles collection contains two specimens taken in 1894 "on the Cedar River."

16. *Anas platyrhynchos* (Linn.) Mallard. A common migrant, arriving in the latter part of March. Webster and Waller state that it once nested in Floyd, Cerro Gordo and Mitchell counties, but it does not do so at the present.

17. *Anas rubripes* (Breswter.) Black Duck. Very rare migrant. I have a questionable identification for April 18, 1918. One specimen, taken near Floyd in 1896, is in the Miles collection.

18. *Chaulelasmus strepterus* (Linn.) Gadwall. Uncommon or rare mirgant. I saw three individuals on March 29,

1918. Waller and others state that they have occasionally shot specimens.

19. *Nettion carolinense* (Gmel.) Green-winged Teal. A rather uncommon migrant in the past six years, although Webster, Waller and others class it as common. Certainly Anderson's reference to it as the commonest duck in Iowa will not hold for Floyd County, where it is exceeded in numbers both by the Pintail and Mallard. The species passes north in April; it has not been reported to breed in the county, though it may have done so.

20. *Querquedula discors* (Linn.) Blue-winged Teal. A rather uncommon migrant, seen in late March and early April, and middle to late November. Flocks of 6 and 11 birds, respectively, seen near Charles City on November 26, 1915 and March 27, 1917.

21. *Spatula clypeata* (Linn.) Shoveller. An uncommon migrant, seldom taken by hunters. One specimen taken near Nora Springs in May, 1914 (C. H. Belanski). Webster and Waller state that prior to 1900 the species might have been classed as common.

22. *Dafila acuta* (Linn.) Pintail. Fairly common migrant, arriving in late March or early April. In numbers it ranks second to the Mallard.

23. *Aix sponsa* (Linn.) Wood Duck. Very rare migrant; is not known to breed in Floyd or adjoining counties. Webster states that it was formerly common during migrating seasons, and probably nested in the county. He reports one specimen seen in March, 1915, and another in April, 1917.

24. *Marilla americana* (Eyt.) Redhead. An uncommon migrant. J. R. Waller reports a flock near Charles City, in March, 1915.

25. *Marilla marilla* (Linn.) Greater Scaup Duck. Rare migrant, although Webster states that it was at one time common. Waller says that he has not infrequently taken specimens when hunting. My last observation was March 23, 1916.

26. *Marila affinins* (Eyt.) Lesser Scaup Duck. An uncommon migrant. (Waller). A small flock was seen by Mr.

Waller near Floyd in March, 1915. I have no records of the species.

27. *Charitonetta albeola* (Linn.) Bufflehead. Contrary to my former statement (Wilson Bull., 96, p. 132) this species is a tolerably common migrant. Cooke (Bd. Migr. Miss. Valley, p. 73) lists it as breeding at Clear Lake, in Cerro Gordo county.

28. *Chen caerulescens* (Linn.) Blue Goose. At one time a common migrant; now rare (Waller). Mr. Waller's last date for the species is in March, 1915. I have never identified the species in Floyd county.

30. *Anser albifrons gambeli* (Hartl.) White-fronted Goose. Rare migrant. Last observed near Floyd, in October 1915, by Waller.

31. *Branta canadensis canadensis* (Linn.) Canada Goose. Common migrant. According to Webster it nested within the county in the late 60's. Its spring arrival is usually in late March.

32. *Branta bernicla glaucogastra* (Brehm.) Brant. There may be some question as to the reliability of various records of this rare migrant. I have what I think is a reliable record for March 17, 1916; five birds on the Cedar River, near Charles City.

33. *Olor colubianus* (Ord.) Whistling Swan. Rare migrant since 1890. Webster states that in "early days" the species was quite common. I have been unable to learn of any specimens seen or killed since 1900, and conclude that the species is no longer part of the county's avifauna.

34. *Olor buccinator* (Rich.) Trumpeter Swan. Webster states that the species was tolerably common in the late 50's. One was killed near Charles City in 1897, but I have been unable to find a later record.

25. *Botaurus lentiginosus* (Montag.) Bittern. A fairly common summer resident, regularly nesting within the county. I have frequently come upon them in the "bayous" of the Cedar River, near Charles City, in July, August and September, though have failed to locate nests.

36. *Ixobrychus exilis* (Gmel.) Least Bittern. A tolerably common migrant and summer resident, but less so that the preceding species. Nests regularly within the county, and probably within the limits of Charles City.

37. *Ardea herodias herodias* (Linn.) Great Blue Heron. A rather uncommon summer resident, though it seems to be increasing in numbers. They arrive in early April, and are most commonly seen along the river near Floyd.

38. *Egretta candidissima candidissima* (Gmel.) Snowy Egret. Casual visitor. "Has been taken at Des Moines and in Floyd County in August." (Keyes and Williams, Proc. Dav. Acad, Nat, Sci., V, p. 120.

39. *Butorides virescens virescens* (Linn.) Little Green Heron. Common migrant and summer resident. Arrives about the last week of March or the first of April, or later.

40. *Nycticorax nycticorax naevius* (Bodd.) Black-crowned Night Heron. Tolerably common migrant; perhaps a summer resident. Webster found it nesting near Floyd in 1897, and in the west part of the county for four years later. It is reported as nesting near Nora Springs in 1913. The species, in common with the Great Blue Heron seems to have increased since 1915.

41. *Grus americana* (Linn.) Whooping Crane. At one time a rather rare migrant (Webster); now probably but a memory in the county's avifauna. The Miles collection contains one specimen, without date. So far as I know, there is no record of the species nesting within the county, although Cooke states that it had been known to nest at Clear Lake. (Bd. Migr. Miss. Valley, p. 85).

42. *Grus mexicana* (Müll.) Sandhill Crane. Webster, Waller, and others, state that this species once occurred in large flocks during the migrating seasons. At present it is, at best, a very rare migrant. I have no definite records.

43. *Rallus elegans* (Aud.) King Rail. An uncommon species during migrations, and a rare summer resident. It arrives in late April; on April 24, 1916, I saw a specimen well

within the limits of Charles City, near the Willow Pond Bird Preserve.

44. *Rallus virginianus* (Linn.) Virginia Rail. An uncommon migrant, probably not a summer resident. Arrives about the same time as the preceding species.

45. *Porzana carolina* (Linn.) Sora. Webster, in 1897, recorded the species as nesting commonly in Floyd county, and a pair probably nested near Floyd in 1917. The species is a common migrant.

46. *Porzana noveboracensis* (Gmel.) Yellow Rail. The Miles collection contains one specimen, collected in 1885. Attached to the specimen was a note: "Floyd, 1885. Crake, uncommon." I have no other record.

47. *Inornis martinicus* (Linn.) Purple Gallinule. An accidental visitor, reported only twice, J. R. Waller shot a specimen near Charles City in 1891. September 9, 1915, Mrs. Mary A. Dutton and Miss S. E. Wetherbee identified one of these birds on the Cedar River, about one-half mile west of the thickly settled part of Charles City. Mrs. Dutton carried glasses and approached within 15 feet of the bird, and her identification seems to me to be reliable. It was not questioned by Dr. Bailey.

48. *Gallinula galeata galeata* (Licht.) Florida Gallinule. This species varies from rare to tolerably common in different years. I have occasionally seen in at Willow Pond, in the north part of Charles City, but is more frequently to be found near Hackberry Grove, in the east part of Cerro Gordo County.

49. *Fulica americana* (Gmel.) Coot. A common migrant and a summer resident, nesting near and within the limits of Charles City, though not commonly. In swampy areas along the Cedar River, between Charles City and Floyd it is not uncommon as a summer resident. I saw three specimens on the Shell Rock River, in Rockford, on July 18, 1919. During the migrating season they are occasionally seen on the Cedar River, in the business district of Charles City.

50. *Steganopus tricolor* (Veill.) Wilson's Phalarope. A fairly common migrant and formerly a not uncommon summer

resident. I saw an immature bird near Charles City on August 12, 1915, and several times have seen young birds near Floyd; perhaps it still breeds there.

51. *Philohela minor* (Gmel.) Woodcock. Mr. J. R. Waller killed one specimen near Floyd in 1904, and on August 23, 1917, I made a sight identification in a swampy area north of Charles City. The latter may well be questioned. Mr. C. H. Belanski states that on several occasions he has made questionable identifications of the species in the neighborhood of Nora Springs. Other records have come in, but it is probable that they refer to the Wilson's Snipe rather than to the Woodcock. In general, it may be said that the species is rare as a migrant and probably absent as a summer resident.

52. *Gallinago delicata* (Ord.) Wilson's Snipe. This species is a fairly common migrant in both Floyd and Cerro Gordo counties, arriving in early April. March 31, 1918, I saw seven birds in a swampy area along Lime Creek, near Hackberry Grove in Cerro Gordo county. In the swamp, now drained, north of the Willow Pond sanctuary in Charles City there are frequently small flocks of these birds throughout April. One bird was observed at this locality on May 6, 1917.

Definite early records are lacking. Mr. Waller tells of having killed many of the birds in the now drained swamps and sloughs west of Charles City. Webster states that near Rockford, at the time of his childhood, the "Jack Snipe" was a common game bird. There are no nesting records.

53. *Micropalama himantopus* (Bonap.) Still Sandpiper. Keyes and Williams state: "Observed but once, and that in early autumn on the open prairie in Floyd County. There were four individuals wading about in a small pond; a single specimen only was secured." (Bds. of Iowa, 1889, 122.) There are no other records for Floyd or adjoining counties, so far as I can discover.

54. *Pisobia maculata* (Vieill.) Pectoral Sandpiper. Although Anderson (Bds. of Iowa, 1909, 217) states that this species is "an abundant migrant in nearly all parts of the state" it is rare in Floyd County. In June, 1913, I observed two individuals near Patten's Pond, southeast of Charles City.

On June 28, 1918, Mahlon Palmer and I identified five individuals at Willow Pond, and on June 29 I identified two at the same locality.

55. *Pisobia fusicollis* (Vieill.) White-rumped Sandpiper. According to Webster and J. R. Waller this species was a rather common migrant near Rockford and Charles City. The reference to it as a "rather common migrant, appearing the last of May about the quiet pools near watercourses" by Keyes and Williams (Bds. of Iowa, 1889, 122) is probably from Williams' observations in Floyd County. I have a very questionable record for May 12, 1917; one bird seen on the bank of Lime Creek, near Rockford.

56. *Pisobia minutilla* (Vieill.) Least Sandpiper. A common migrant in Floyd and adjoining counties. In both spring and late summer it is abundant along the bayous of the Cedar north and west of Charles City. It associates with both the Semipalmated Sandpiper and the Spotted Sandpiper. The spring migration begins about the first of May and lasts throughout the month. The birds reappear in late July or early August and may be seen well through September.

57. *Ereunetes pusillus* (Linn.) Semipalmated Sandpiper. A rather uncommon species associated with the foregoing in its migrations. I saw five specimens at Willow Pond on May 23, 1918. It is usually to be seen along the Cedar River.

58. *Limosa fedoa* (Linn.) Marbled Godwit. Rare migrant in Floyd County. (Webster.) Mr. J. W. Preston found it breeding at Clear Lake, in Cerro Gordo county. (Cooke, Bd. Migr. in Miss. Val., 1884-5, 94.) I have a questionable identification made at Hackberry Grove, Cerro Gordo county, on June 6, 1917.

59. *Totanus melanoleucus* (Gmel.) Greater Yellow-legs. A fairly common migrant, being seen mostly in sloughs and along the streams. It appears in the spring in late April. On June 12, 1917, I saw four individuals on Flood Creek. The autumn migration is irregular, beginning in mid-September and lasting into October.

60. *Totanus flavipes* (Gmel.) Yellow-legs. More common

than the preceding species. It is common along the streams and near ponds, appearing in late April. On June 12, 1917, I saw two individuals on Danforth Creek about two miles west of Charles City; on August 7, 1915, several birds were seen in a slough in the northwest part of the town.

61. *Helodromus solitarius* (Wils.) Solitary Sandpiper. Fairly common migrant, arriving about April 24 and remaining to the middle of May. My earliest summer record is August 3 (1918; four specimens near Willow Pond). My latest is September 28 (1916; two specimens along the river near Brackett's Woods).

62. *Bartramia longicauda* (Bechst.) Upland Plover. Webster states that he has identified the species, but can give me no dates. I have a questionable record for June 6, 1914. May 24, 1917, I identified three individuals about a mile north of Charles City. There is no indication that the species has ever nested in the county.

63. *Tryngites subruficollis* (Vieill.) Buff-breasted Sandpiper. Rare. I have one specimen, secured near Charles City on September 9, 1915. The specimen was identified by Dr. B. H. Bailey.

64. *Actitis macularia* (Linn.) Spotted Sandpiper. This little sandpiper is a very common migrant and a common summer resident in Floyd and adjoining counties. The species arrives as early as April 6 (1915; two individuals at Willow Pond). On April 15, 1917, I identified four of the birds on Danforth Creek, near Charles City, The spring migration seems to be at its height in the third week of May. The autumn migration begins about August 10, and birds have been seen as late as October 13.

65. *Numenius americanus* (Becht.) Long-billed Curlew. Messrs. Webster and Waller say that during the 60's and 70's this species was a fairly common summer resident. It is now a rare migrant. I have a questionable identification for April 11, 1915, near Charles City. On April 14, 1918, I saw two birds that were without doubt of this species at Wildwood Park. I have no other records.

66. *Charadrius dominicus* (Müll.) Golden Plover. A rare migrant, although Webster states that it was at one time common. There were two records for it near Charles City in 1915, and it is probable that the same individuals were seen in both cases. On August 31, 1916, Mrs. M. A. Dutton and I identified three individuals of this species near Oak Park, in the northern part of the town.

67. *Oxyechus vociferus* (Linn.) Killdeer. A common summer resident. It arrives March 13 to March 21, March 16—20 being the average. It nests both in stream beds and in pastures. On May 26, 1918, C. Herbert Belanski and I found the species nesting in the partially dry bed of Hackberry Creek. On June 3 I saw young Kildeers in the southeastern part of Charles City.

68. *Aegialitis semipalmata* (Bonap.) Semipalmated Plover. Webster states that this species is a rare migrant in Floyd County. Mrs. F. May Tuttle identified one near Osage, in Mitchell County on November 3, 1914. Mahlon Palmer and I saw three individuals in a pasture west of Charles City on October 3, 1916.

69. *Colinus virginianus virginianus* (Linn.) Bob-white. This species was at one time very common in Floyd County. Mr. Waller says he has seen them in large flocks on the prairies of the county. Mr. Will T. Swartz says that when unmolested they commonly came into the farmyards and fed with the poultry. In 1914 and 1915 the species was rare, and in 1916 I listed it so (Wilson Bull., no. 96, p. 136). Within the last five years, however, it has increased considerably in numbers. In 1913 a pair nested in Wildwood Park, near the buildings of the Sherman Nursery Co.

70. *Bonasa umbellus umbellus* (Linn.) Ruffed Grouse. The Ruffed, Grouse or "Partridge" as it is commonly called, is a rare bird in Floyd and adjoining counties. Webster, in 1897 (History of Floyd County) listed the species as rare except in the deep woods. A single individual was killed in December, 1917, by a huntsman from Charles City. Two specimens, taken some years ago at Big Springs, on the Cedar River, are in the Miles collection.

71. *Tympanuchus americanus americanus* (Reich.) Prairie Chicken. That this species was one time very common in the region is stated by many hunters and observers. It is now rare. Mr. John R. Waller saw a small flock in January, 1916, and in November, 1918, a flock of about a half dozen individuals was seen near Orchard. Webster, in the Iowa Naturalist, describes two albino Prairie Chickens taken near Niles, in Chickasaw County, but gives no dates of collection.

72. *Meleagris gallopavo silvestris* (Vieill.) Wild Turkey. In 1897 Webster classed this species as rare; it was probably almost extinct so far as the county is concerned. Among some loose notes with the Miles collection is the record of one specimen having been shot near Bloody Run, south of Charles City, in 1898. The specimen is lacking.

73. *Ectopistes migratorius* (Linn.) Passenger Pigeon. Very common during the "early days." (Webster, Waller, Dutton, and others). Keyes and Williams state: "A nest with one egg was taken at Charles City, June 14, 1879." (Bds. of Iowa, 1889, 125.) The last authentic record is by Webster, in 1897. The species probably had disappeared from the county by 1900. There are occasionally alarms when someone thinks he has discovered a Passenger Pigeon, but the "Discovery" is always a Mourning Dove.

74. *Zenaidura macroura marginella* (Woodh.) Mourning Dove. An abundant summer resident. It arrives in March or early in April and nests in early May. I have found nests with eggs in them in May, June and July, and young but a few days old in the middle of August. The species departs in the sceond and third weeks of October, with a few individuals hanging on until the last of the month.

75. *Cathartes aura septentrionalis* (Wied.) Turkey Vulture. Listed as rare by Webster in 1897 (History of Floyd County.) Several farmers have told me of having seen "Buzzards," and John R. Waller states that he has on several occasions shot them. There are no records, however, within the last fifteen years, and the species is probably no longer to be found in the county unless accidental stragglers should appear.

76. *Elanoides forficatus* (Linn.) Swallow-tailed Kite. Mr. Webster tells me that this species was at one time tolerably common, but could furnish no further data. John R. Waller says that he has occasionally shot specimens. There is a single specimen, probably taken in the county, in the Miles collection. Considerably to my surprise C. H. Belanski and I identified a specimen of this bird at Hackberry Grove, in Cerro Gordo County, on May 28, 1916.

77. *Circus hudsonicus* (Linn.) Marsh Hawk. The Marsh Hawk is a common summer resident in Floyd and adjoining counties. The relative abundance seems to vary rather markedly from year to year. Spring arrival in late March of early April, and departure takes place in late October and early November. Due to the habits of the species it is less noticed, and therefore less persecuted than others of the hawks.

78. *Accipiter velox* (Wils.) Sharp-shinned Hawk. A common migrant and a less common summer resident. On May 4, 1917, I located a nest of this species, with two eggs in Waller's Woods, northeast of Charles City. In July of the following year young birds were observed in this same woodland.

79. *Accipiter cooperi* (Bonap.) Cooper's Hawk. This species is a common summer resident. Prior to 1916 I found no nests with eggs or young, but in 1916, 1917, 1918, and 1919 occupied nests were located in various parts of the county and near Hackberry Grove.

80. *Accipiter atricapillus atricapillus* (Wils.) Goshawk. A rather rare migrant and perhaps winter resident. Four individuals were seen in the northern part of Charles City on November 11, 1917, and there were several reports of the species in the third week of April, 1918. It is probable that all of these records applied to the same birds. I saw two individuals on April 16.

81. *Buteo borealis borealis* (Gmel. Red-tailed Hawk. A tolerably common summer resident, arriving in mid-March. Nests with eggs have been found in the second week of May,

and I have observed brooding birds as early as May 2 (1917). These birds breed in considerable numbers in the woods along the Cedar River between Charles City and Floyd, and also north of Floyd.

Since field determinations of the various Red-tailed Hawks are at best rather questionable it is quite probable that some of the records noted above apply to the following form.

82. *Buteo borealis krideri* (Hoopes.) Krider's Hawk. This paler phase of the Red-tail is probably not uncommon in the region but due to lack of distinction between it and the preceding species records are scarce. On September 3, 1917, I found a dead bird belonging to this variety. Dr. Bailey (Raptorial Bds. of Iowa, 1918, 109) records the species as occurring in Cerro Gordo County and nesting in Hancock.

83. *Buteo lineatus lineatus* (Gmel.) Red-shouldered Hawk. Apparently my statement (Wilson Bull. 96; 137) to the effect that this species was more common in Floyd County than the Red-tail was unjustified. I should by no means class the species as rare, as does Anderson (Bds. of Ia., 1907, 249), but its numbers are certainly less than those of the preceding. It nests throughout the county. I have seen nests near Charles City, Floyd, Nora Springs and Rockford in every year since 1914.

84. *Buteo swainsoni* (Bonap.) Swainson's Hawk. An uncommon species. Webster states that he has seen the species two or three times in the last five years. I saw one specimen in woods west of Charles City on April 30, 1918. Mrs. F. May Tuttle, of Osage, has a specimen taken in Mitchell County on May 13, 1914. I know of no nesting records.

85. *Buteo platypterus* (Vieill.) Broad-winged Hawk. A common species throughout the county. I have found it nesting in the neighborhood of Charles City in 1913, 1915, and 1918. September 24, 1917, a flock of 16 of these birds was seen in Brackett's woods, north of Charles City. In May, 1918, a pair was found nesting southeast of Nora Springs. In June of the same year a nest was found in the oak grove above the Hackberry Grove clay bank, in Cerro Gordo County.

86. *Archibuteo lagopus sancti-johannis* (Gmel.) Rough-

legged Hawk. Seemingly an uncommon winter resident. Mrs. F. May Tuttle reports a specimen seen at Osage, in Mitchell County on Jan. 1, 1915. October 20, 1917, I saw two specimens in a large linden tree in Brackett's woods. Webster states that he has seen it occasionally, and John R. Waller says that he has killed specimens in both light and dark phases.

87. *Aquila chrysaetos* (Linn.) Golden Eagle. An uncommon winter resident (Webster and Waller). Specimens were shot near Charles City on November 18, 1914, and near Nora Springs on November 5, 1915.

88. *Haliaeetes leucocephalus leucocephalus* (Linn.) Bald Eagle. Webster (Hist. Floyd Co., 1897) states that this species was not rare, and during "early days" had been quite common. Mrs. F. May Tuttle reports a specimen seen near Osage, Mitchell County, on March 26, 1914.

89. *Falco columbarius columbarius* (Linn.) Pigeon Hawk. An uncommon migrant. My only reliable records are: September 5, 1913, April 4, 1916, and April 12, 1917. A questionable nesting record was given me for 1915.

90. *Falco sparverius sparverius* (Linn.) Sparrow Hawk. A common species throughout the county, and probably the adjoining counties. It arrives in late March or early April. May 8, 1915, the species was found nesting in Oak Park, north of Charles City, the birds having occupied an old flicker hole in a dead linden. In 1917 nests were located in Brackett's woods and Wildwood Park, Charles City, and in 1918 the species was found nesting near Rockford.

91. *Pandion haliaetos carolinensis* (Gmel.) Osprey. A rare migrant (Webster). My only record of the species is a single specimen seen near Hackberry Grove on May 28, 1916.

92. *Aluco pratincola* (Bonap.) Barn Owl. Rather plentiful as late as 1881, according to a note made by W. C. Miles, and found with his collection. Webster says that, so far as his observations show, the species was never more than uncommon, and disagrees with the Miles record. At present the Barn Owl is a rare resident. A pair nested in Charles City

in 1914, and Howard C. Brown and I had, for a short time, one of the young ones, fallen from the nest.

93. *Asio wilsonianus* (Lesson.) Long-eared Owl. This species is a more or less uncommon resident. In 1917 two pairs nestled in Waller's Woods, about 2 miles northeast of Charles City. C. Herbert Belanski reports it from Nora Springs, and the Charles City High School possesses a specimen collected near Rockford in 1904.

94. *Asio flammeus* (Pontoppidan.) Short-eared Owl. A common owl, nesting in the sloughs north of Charles City and near Floyd, and west of Charles City. Specimens have been taken from Charles City, Floyd, Nora Springs, Rockford, and Devonia.

December 3, 1914, Howard Clarke Brown and myself examined the stomach of a specimen taken near Charles City. One mouse much digested, and another evidently recently swallowed, along with a quantity of hair, were found. On December 3, 1915, a specimen was examined, the stomach contents being a partly digested mouse. January 19, 1916, I examined the stomach of a specimen taken near Orchard, the only contents being some rodent bones and a ball of mouse hair. The first two specimens were females, the last, a male.

95. *Strix varia varia* (Barton.) Barred Owl. A common species in all seasons. I have observed it at Charles City, Floyd, Rockford, Nora Springs, and Nashua in Chickasaw County. They nest in woods near all of these towns. No examinations of stomach contents were made.

96. *Cryptoglaux acadica acadica* (Gmel.) Saw-whet Owl. A rare winter visitant. I saw one specimen on January 6, 1917, and another on November 27 of the same year. These are my only records.

97. *Otus asio asio* (Linn.) Screech Owl. The commonest owl of the region, the gray phase being the more common. I have found the species nesting at Charles City, Floyd, and Rockford. In 1915 and 1916 C. Herbert Balanski reported it as nesting at Nora Springs, and Webster reported in from Devonia (then Lithograph City) in 1915, 1916, and 1917.

98. *Bubo virginianus virginianus* (Gmel.) Great Horned Owl. This species is uncommon in Floyd County. On March 7, 1918, I located a nest with incubating bird in Brackett's woods; this is the only nest record that I have. C. Herbert Belanski reports the species from Nora Springs, and I saw a specimen killed near Rockford in 1918 (December). On the 24th of December, 1918, I received for mounting a large male shot between Charles City and Floyd. The stomach contained the flesh and feathers of a pigeon, along with some hair, probably of a rabbit.

99. *Nyctea nyctea* (Linn.) Snowy Owl. A rare winter resident. December 23, 1913, I saw a specimen near the Cedar River, about two miles south of Charles City. In May, 1917, I saw the remains of one of these birds nailed to a fence in Nora Springs, and on inquiry learned that the bird had been killed in the preceding February. The Charles City High School has two specimens, one without locality or date, the other taken near Carrville in 1908.

The First Robin.

Great pleasure is always experienced by everyone at the announcement of the arrival of the first robin. Newspapers will print any reliable report of this bird's appearance as being of general interest to their readers. To the average person the robin is the first of birds to return, and naturally its presence is hailed as one of the earliest signs of approaching spring. The arrival of the first robins usually occurs on one of the last days of winter, when the cold weather is relenting. While this is true, it does not necessarily follow that warm days will at once bring sunshine and cheer; for often after the robins have come there will be periods of inclement weather. In fact the robin seems to enjoy cold winds and rains, and will sing contentedly while gloom wraps earth and sky.

Not all of the robins leave us in winter. Any diligent bird lover who goes out regularly in December and January will be likely to see at least one robin in his walks. The writer had this good fortune on December 3, 1922, and an acquaintance of his expressed surprise at finding a robin in January of the present year. In 1918, in mid-winter, during unusually cold weather, robins were seen almost daily for a month. The vigor of that season had probably driven all the robins which were wintering farther north to places where they could obtain food and water. The newspapers at that time had frequent reports of wandering flocks of robins in the northern states.

The robins that appear in the latter part of February are not winter residents, but are the vanguard of the mighty army of migrants which will soon spread over the northern states. The robin records obtained by the writer in February for eight years are as follows:—1911, Feb. 25; 1915, Feb. 13; 1916, Feb. 22; 1917, Feb. 23; 1919, Feb. 28; 1921, Feb. 27; 1922, Feb. 21; 1923, Feb. 28. The average date for the month of February, from these records, is the 23rd. The condition of the weather in February of these years may be judged by the dates of arrival of the robin. When the month

of February is very stormy and winter lingers into March, the first robin will not appear until there is a mitigation of the elements.

The March records which I have obtained in six years for the first robin are—1919, March 2; 1910, March 1; 1912, March 14; 1913, March 9; 1914, March 13; 1920, March 10. These dates give as an average, March 8. Between this date and the average for February then are fourteen days. As only four dates in March occur in the second week, we may conclude that normally the first robin will appear either in the last week of February or in the first week of March. Earlier or later dates are so rare that they may be regarded as exceptional or unreliable. As a matter of fact, when I have found the first robin later than March 8th, I have heard of other observers who made earlier records; and so I have concluded that my late dates for the first robin were not the correct ones.

BROTHER ALPHONSUS, C. S. C.,
Notre Dame, Indiana.

BOOK REVIEWS

In this section are reviews of new, or particularly important and interesting books in the fields of natural science. Books dealing with botany or kindred subjects should be sent to the Editor, the University of Notre Dame. *All other books for review* should be sent to Carroll Lane Fenton, at the Walker Museum, the University of Chicago, Ill. Publishers are requested to furnish prices with books.

Darwinism and Catholic Thought by Canon Dorlodot, D. D., D. Sc. Translated by the Rev. Ernest Messenger of St. Edmund's College, Ware.

Vol. One; The Origin of Species. Burns and Oates, 1922.

This is a 16 mo. of 184 pages, and 8 additional pages in the table of contents. On the title page we read, "Vol. One; The Origin of Species." There are two conferences in this volume dealing with the origin of species, and the author promises another conference, or, perhaps, several other conferences on the descent of man.

The first conference deals with "Darwinism and the Work of the Six Days." The second conference treats "Darwinism in the Light of Catholic Tradition and Catholic Philosophy." The book was written as a rejoinder to certain criticisms that were made on the address of the author, delivered as official delegate of Louvain before the University of Cambridge on the occasion of the Darwinian centenary. The conferences were "delivered during the war before the professors of the University of Louvain at the invitation of the rector." (From the foreword to the French edition.)

The general question that is treated in the two conferences is,—"What judgment must we pass upon the Darwinian theory from the point of view of Catholic orthodoxy, if we leave out the special subject of the origin of man?" (p. 3). The fundamental teaching of Darwin is summed up in two propositions;—

1) The primary origin of living things is the result of a special influence on the part of the Creator, Who infused life into one or a few elementary organisms.

2) These organisms, by evolving in the course of ages, have given rise to all organic species which exist at the present time, as well as those that have come down to us only in the fossil state. (p. 4).

Dorlodot calls this a "fairly moderate system of Natural Evolution" and says that opposed to it are two "extremist opinions, Absolute Evolution and Creationism or Fixism."

"Absolute Evolution denies the special intervention of God, even in the origin of life; it attributes the first origin of living beings to a natural evolution of inorganic matter, which became organized and

ultimately living matter by the simple action of forces, or, better still, of powers inherent in matter, or which at least were inherent in it in days gone by."

"The creationist theory admits a special intervention of God at the beginning of each of the groups which we now call species."

Between these two extremes there are many theories.

The guiding principles of the Catholic interpretation of the Sacred Scriptures are, according to Dorlodot,

1) The Encyclical Providentissimus Deus of Nov. 18, 1893, and,

2) The decrees of the Biblical Commission.

The author examines the general question in the light of the two guiding principles just mentioned, and arrives at the following conclusion,—

"We cannot find in Holy Scripture, interpreted according to the rules of Catholic exegesis, any convincing argument against the theory of natural evolution—even that of absolute evolution, for the sacred text does not justify the conclusion that the appearance of species was due to a special intervention on the part of God."

A number of statements in the first Conference seem to call for comment. On page 11, for instance, we read;—"And, speaking generally, we must reject a priori any interpretation which would make a text of Holy Writ a divine instruction upon a subject belonging to the physical or natural sciences." The translator seems to have foreseen that this statement would not go unchallenged. To forestall criticism, he quotes two propositions from the encyclical of Leo XIII., which, he says, warrant the author's conclusion. The propositions are;—

"1) The Holy Ghost so moved the sacred writers that they wrote all those things and only those things which He Himself ordained, and

"2) The Holy Ghost, who spoke through the sacred writers, did not wish to teach men those things which He Himself ordained."

On page 39, we read,—"the term reptile does not mean for a naturalist a crawling animal, and this is especially true of the reptiles of the secondary epoch."

This statement is, at least, inexact. Snakes, lizards, etc., are certainly "crawling animals" in the sense of the author. But the naturalist comprehends all of them under the term "reptile."

Again, on page 40 there is this statement,—"the birds of to-day no longer possess teeth." This is true of adult birds. But the embryo has, if not actual teeth, at least the dental ridges. (Kingsley, p. 231).

The second conference,—"Darwinism in the Light of Tradition and Catholic Philosophy"—contains four propositions. These are;—

1) The teaching of the Fathers is very favorable to the theory of absolute natural evolution;

2) Aristotelian scholastics generally limited the theory of absolute natural evolution to a section of living beings for scientific reasons (spontaneous generation) but still, all the doctors remained faithful to

the spirit of Christian naturalism. Provided we remain faithful to this spirit, we are free to accept, at least provisionally, a less radical solution than that of absolute natural evolution, if the present state of science makes it advisable;

3) The application of the principles of Catholic Theology and Philosophy-principles themselves certain—to the concrete data of the sciences of observation, elevated into an absolute certainty the conviction of the simple naturalist who holds a very radical system of transformism. Such application leads us to accept at least as eminently probable the theory which derives all living beings from one or a few very simple types of organisms, which is Darwin's own view. On the other hand, since there are scientific difficulties against the theory of absolute evolution, Darwin's special hypothesis of a special intervention on the part of God at the origin of life seems legitimate, at least for the time being.

4) The Catholic theory concerning the natural activity of secondary causes is capable of explaining a natural transformist evolution as Darwin understood it, and entitles us to reject as entirely superfluous the additional special intervention postulated by those who hold the fixity of specie or by the moderate creationists. (pp. 5-6).

In his proof from tradition, Dorlodot mentions that "the Fathers who dealt with this matter, up to the 8th century, are unanimous in holding that there was no special divine intervention in the formation of the world beyond the creative act by which God called forth the universe from nothing at the beginning of time." (p. 66). The Fathers mentioned are Origin, Gregory of Nyssa and Augustine. Dorlodot seems to have some doubts about the authority of Origin because this Father "while holding the creation of the world from nothing, thought that this creation was eternal." Now there can be no question of a "natural evolution of the world, for if everything was made simultaneously there is no room for evolution." But "neither is there room for special divine interventions chronologically distinct from the creative act at the beginning of things." (p. 70).

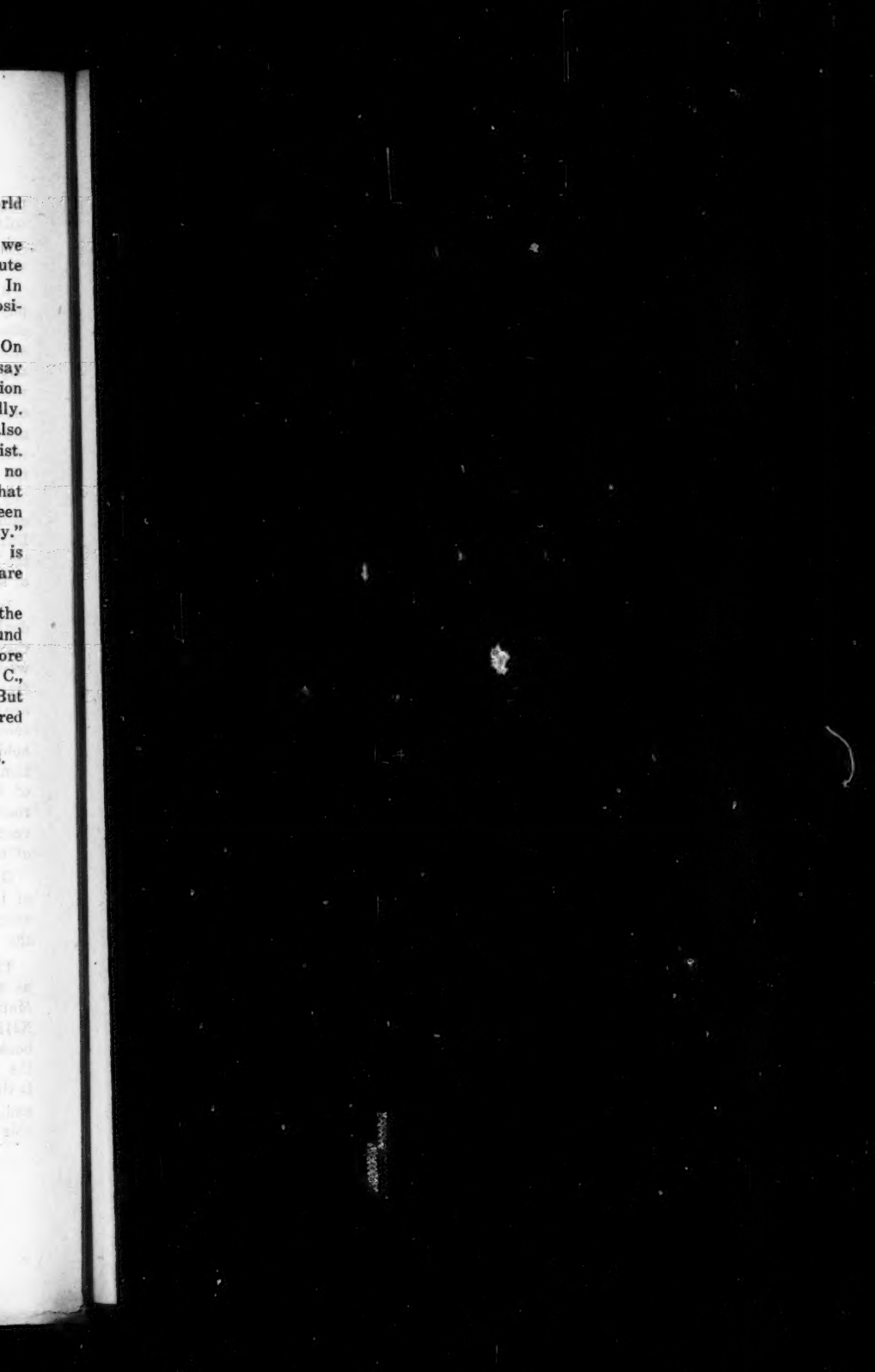
Gregory's theory is called a "theory of absolute evolution in the case of living things as well as the organic world. It formally denies any special intervention on the part of God other than the unique impulse, the mia hrope, of the original creation." (p. 79).

The works of St. Augustine on which Dorlodot bases his conclusions as to that Father's opinions on this question are;—De Genesi contra Manichaeos, Confessions, De Genesi ad litteram, Chapters XI., XII., XIII., of the Civitate Dei. The teaching on evolution is in the twelve books De Genesi ad litteram. There is only a parenthetical reference to the Retractationes. The author's conclusion in regard to St. Augustine is that this Father was the firmest believer in absolute natural evolution, and, if "inaccurately translated texts had not stopped him, we should be able to place St. Augustine side by side with St. Gregory of Nyssa as

one of the upholders of the evolutionary origin of the inorganic world as well as the organic world."

Dorlodot thinks that Darwin did not go far enough and that if we follow the Fathers of the Church, we must go further and accept absolute natural evolution. He himself is not quite ready to go that far. In fact, after reading this book, one is not quite clear as to the exact position of the author.

A final example of the author's method will not be out of place. On page 89 there is a statement to the effect that it is unreasonable to say that the ovum of a given species cannot develop without fertilization because to-day, the eggs of sea urchins are hatched parthenogenetically. The fact of the parthenogenetic development of sea urchin eggs, as also the eggs of other animals, will not be denied by any present-day biologist. But from the hatching of an ovum to the origin of an animal from no ovum at all is a pretty far cry. It is also suggested—page 90—that "conditions for spontaneous generation of certain animals may have been present in the first ages of the world which are no longer present to-day." The author seems here to forget entirely that the one point which is stressed throughout the whole book is that the same natural laws are operative now as were operative in the beginning.

It seems to us that, on the whole, this book is not deserving of the importance that some press notices attach to it. The entire ground covered in the book has been covered,—and in our opinion much more thoroughly,—thirty years ago by the Rev. Dr. John A. Zahm, C. S. C., in his "Evolution and Dogma." Dorlodot's book is brief and concise. But it contains merely the old materials worked over. We discovered nothing new.

FRANCIS J. WENNINGER, C. S. C., M. S.